U.S. TRADE AND DEVELOPMENT AGENCY

EXECUTIVE SUMMARY

South Africa Fluidized Bed Combustion Feasibility Study for Unit 7 at Komati Power Station

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Eskom Feasibility Study

1.0 Executive Summary

Komati coal fired power plant, in the Mpumalanga region, is one of the "moth-balled" power plants being considered by the FBC Joint Venture Committee (FBC-JV Committee) to be recommissioned to meet the growing power demand in the near future. Availability of large quantities of low-grade coal in the Mpumalanga region deposited as waste coal from the coal-mining operations, and the environmental concerns of these deposits, offers an attractive option to repower the Komati Power Station with circulating fluidized-bed technology, which can economically utilize the vast quantities of low-grade coal while reducing the environmental hazards presented by those deposits.

Black & Veatch International, appointed by the FBC-JV Committee under a United States Trade & Development Agency grant, has carried out a feasibility study for a pilot project to repower one generating unit with Fluidized Bed Combustion (FBQ technology, utilizing the available low-grade coal.

The key investigations and evaluations to determine the feasibility study included the following:

- Repowering aspects of the existing power generation facilities at Komati power plant.
- Fuel and sorbent evaluation.
- Plant technology and configuration.
- Design and performance aspects, including environmental considerations.
- Cost estimates.
- Implementation plan.

The investigations and evaluations were carried out on the basis of information, documents, and discussions with Eskom, collieries and other organizations, and a plant assessment carried out by the BVI project team. An executive summary of the study highlighting the key results and recommendations is as follows.

1.1 Repowering of Komati Unit 7

Komati Power Plant Unit 7 turbine generator and its auxiliaries and associated equipment is determined to be the best available option for a pilot project for repowering. The repowering of Unit 7 can be accomplished with the installation of a new FBC steam generator to be located outside of the existing boiler building, north of the existing Units 6 and 7. The existing material handling system can be utilized with appropriate refurbishment to meet the requirements.

The Study determined that the repowered Unit 7 will consist of the following major components and refurbishments:

A new FBC steam generator. The performance parameters will include a maximum continuous rate of 525,600 kg/h of steam at 8,267 kPa, and 510' C. The unit can remove up to 85 percent Of S02 produced through the addition of sorbent to the combustion process.

The existing Unit 7 turbine-generator is rated for 125 MW and can be expected to deliver 113.8 MW at the generator terminals, considering the applicable de-rating of the unit. The turbine -generator will undergo extensive refurbishment based upon the Lifex reports.

Fuel for the plant will consist of as-arisings from the three different collieries (Koomfontein, Bank, and Goedehoop), delivered to the site via trucks. The quality of fuel supplied to the plant will be maintained within the range acceptable to FBC boiler design, through prudent measures taken in the production and handling of waste coals. These measures include selective re-mining of stockpiles and selective blending and mixing of as-arisings. As an alternative, a fuel blending system is proposed to overcome fuel variability.

Sorbent will be delivered to the site via trucks. A 15-day supply of sorbent is proposed to be stored at the site.

Existing fuel oil storage tank will be maintained for startup and low load operation by FBC and by sorbent dryer.

Particulate emissions are proposed to be controlled by using the existing precipitators with appropriate refurbishments and modifications. The refurbished precipitator is expected to meet the increased dust burden from the FBC steam generator in accordance with Lurgi Emission Control Plan Refurbishment Study recommendations. As an alternative, installation of new pulse-jet fabric filters is recommended for consideration.

The ash disposal from the plant is proposed to be handled by the existing wet ash handling system with appropriate refurbishments and upgrades. New pipelines will discharge slurry to the existing ash pond disposal area. Proposed as an alternative is a dry-ash handling system in which ash will be transported to ash silos and from there transported to nearby landfills by truck.

Existing closed cycle cooling water system, service water treatment, and wastewater collection and treatment are expected to continue to operate as before.

The existing switchyard and transmission line will continue to be utilized for connecting the power plant with the Eskom transmission grid. Upgrade and/or refurbishments that may be required are not **included in the** scope of this study.

1.2 Fuel and Sorbent

1.2.1 Sources and Delivery

Fuel for Unit 7 is proposed to be sourced from coal wastes from the following coal mines:

The Koornfontein Colliery.

The Bank Colliery.

The Goedehoop Colliery.

The nearest, Koornfontein Colliery, is located at an approximate distance of less than 3 kin. In addition, there are numerous other existing collieries with active and closed waste dumps containing refuse from coal beneficiation operations within a distance of 30 km.

A sufficient quantity of low-grade coal is estimated to be available to fuel the repowered Unit 7 for a 30-year plant life. It is estimated that the current production of as-arising discard from the three collieries identified above could fuel 350 to 450 MW of power generation for an economic life of at least 10 years after startup. Once the supply of as-arising discard is reduced, the supply will be supplemented by coarse dump material that is currently being stacked as waste piles at various collieries.

Sufficient sorbent is estimated to be available to meet the requirements of the FBC plant. There are a few large deposits of limestone within 200 kin by highway from the Komati Power Station. Therefore, the FBC-JV Committee has considered alternate sorbent, such as dolomite, worthy of investigation. Marble Hall limestone deposits, located approximately 105 kin north of Middleburg, has about 750 hectares of reserve area. These reserves contain about 15 million tonnes of limestone at depths of less than 40 meters. Marble Hall also has dolomite deposits. Dolomites have a CaC03 content of about 57 percent, compared with 80 percent for limestone. Another source for dolomite is Lyttleton, which is located approximately 120 km west of Middleburg. Significant reserves of dark dolomite are available at Lyttleton. In addition, there are other locations with virgin dolomite deposits available within proximity (150 km max.) to Komati Power Station.

Based on current information, road transportation appears to be more competitive than railroad transportation for both waste coal and sorbent.

1.2.2 Quality of Fuel

The quality of the as-arising discard and waste dump coal from the three mines is observed to have a wide variation. The following table lists the average